1 Interview Summaries

1.1 Maine Department of Environmental Protection

Interview Type	Personal, State Agency
Interview Loc.:	DEP Offices, Augusta
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Interviewer	AGI / Richard Sutton (rs@appgeo.com)
Interviewed:	Christopher Kroot, christopher.kroot@state.me.us (present for all interviews). Additonal interviewees, in temporal interview order: Vicki Schmidt, Lyle Hall, Janet Parker, Tracy Weston, Larry Dearborne, Elizabeth Maquire, Richard Heath, Jeanne DiFranco, Mike Smith, Glenn Angell, Nathan Howard, John Lynam, Iver Mcleod, Mark Holden, Donna Grant, Bruce Hunter, Jeff Dennis, David Blocher

Staff Size (approx)	450
Budget (approx)	$55,000,000
URL:	http://www.state.me.us/dep/index.htm http://www.state.me.us/dep/gis/

1.1.1 Agency Overview

The Maine Department of Environmental Protection (DEP) is responsible for environmental monitoring and regulation in the state of Maine. DEP is organized into the following major units: the Board of Environmental Protection (appointed by the Governor), the Commissioner's Office and three bureaus which administer the Department's environmental programs: Air Quality, Land and Water Quality, and Remediation and Waste Management.

The DEP makes recommendations to the Legislature regarding measures to minimize and eliminate environmental pollution, grants licenses, initiates enforcement actions, and provides information and technical assistance.

DEP maintains a number of offices throughout the state, which provide accessibility to municipalities and the public and allow staff to accomplish necessary field work. Regional Offices in Augusta, Bangor, Portland and Presque Isle are maintained by staff form the Air, Land and Water, and Remediation Bureaus.

1.1.2 GIS Initiatives

1.1.2.1 Overview of GIS Utilization

DEP is presently the most aggressive and well funded innovator and implementer of GIS among all Maine agencies and departments. The DEP has been building its enterprise system and developing custom applications for GIS users for 10 years. Since the early 1990's DEP has been actively integrating GIS into business processes by developing user interfaces to accommodate workflows rather than adjusting workflows around the storage formats of spatial data.

Over the past seven years, and in order to satisfy ever growing needs in this area, the DEP GIS Unit designed and developed GIS applications using object technology. Since 1999 this effort has accelerated into a truly enterprise-wide, exhaustively modeled GIS services delivery strategy, fueling further need for even more intuitive, easy to use user interfaces and data structures.

DEP's dedication to organizing data and application code around rigorously logical and scalable object-based principles has created a system capable of serving hundreds of users and accommodating orderly growth into the foreseeable future.

1.1.2.2 GIS Operating Environment and Infrastructure

Software

The DEP GIS unit uses several software platforms for its enterprise development and implementation:

GIS Software:	Full line of ESRI products, Microsoft COM, Java, and other object technology
RDBMS:	Oracle products – CORBA and Java objects
Custom applications:	Visual Basic (and VBA), Visual C++, Delphi, Java
Design tools:	Oracle Designer and Microsoft Visio 2000

By 1999 DEP had approximately 60 active users of ArcView3.2. Since that time the department has committed to moving fully to ArcInfo8, with a capability of supporting 48 concurrent users. Presently GIS analysis is occurring in a combination of ArcView and Arc8 environments, with ArcView defection occurring as Arc8 COM applications come on line and prove themselves to be dependable replacements.

When the DEP enterprise GIS implementation is fully deployed, GIS software will be universally accessed via Microsoft Terminal Server and Citrix Metaframe.

Modeling

Maine DEP has adopted the Unified Software Development Process (USDP) for the implementation of Enterprise Geographic Information Systems. The purpose of USDP is to provide a standard methodology for turning organizational requirements into software systems. DEP uses this development and modeling strategy to identify all components of a specific, functional end user interface, and integrate them transparently with the various data tables and spatial data resources necessary to bring these various components to the user's desktop.

The primary objective of this effort is to empower hydrologists, geologists, marine scientists, wildlife biologists, project managers and other professionals with useful spatial technology without requiring them to be heavily trained GIS specialists or to keep them constantly reliant on specialized GIS staff. This requires an enormous investment of

system architecture and modeling work, but the ultimate payoff is a working environment where all resources of the enterprise are available to augment any analytical undertaking.

Training
Maine DEP currently has trained more than 30 internal staff in generic ArcInfo 8.0, hundreds in ArcView, and is supporting approximately 120 GIS users within the department. Users can access the applications from any of DEP's 6 office buildings, share projects and enjoy practical system response times.

Distributed Access
Maine DEP has centralized data storage to a single Unix server running Oracle and ESRI Spatial Database Engine. Applications are served to users with Citrix Metaframe terminal server, available to all employees via the state WAN.

1.1.2.3 GIS Data Resources and Requirements

1.1.2.3.1 Spatial Data

DEP maintains and uses a very large number of spatial data layers. The projection system of these layers complies with the MeGIS statewide UTM Zone 19 NAD83 meters projection. Additionally, Canadian data are maintained in variations of the Lambert Conformal Conic Projection.

Existing data sets:
All DEP enterprise vector data are stored in SDE geodatabase format. These are organized into the following thematically grouped folders:

brwm.gps_cad_data - specific data layers for BRWM projects from GPS and CAD
dep_gis.canada - Canada-wide data at various scales
dep_gis.logis_atlas - a working area for the Logistics Atlas and annotation creation
dep_gis.maine_atlas_grids - grids used by the new Atlas Creation System
dep_gis.maine_carto_grids - map boundary grids (USGS maps, NOAA charts, DeLorme)
dep_gis.maine_demographics - census data
dep_gis.maine_dep - DEP-specific data, such as groundwater wells and sites
dep_gis.maine_fauna - data specific to fauna of Maine, mostly for oil spill maps
dep_gis.maine_flora - vegetation data for Maine, including eelgrass
dep_gis.maine_geology - bedrock, soils, coastline, geology
dep_gis.maine_hydrography - rivers, streams, ponds
dep_gis.maine_industry - industrial sites for oil spill maps
dep_gis.maine_political - jurisdictional boundaries and school locations
dep_gis.maine_regional - bioregions, ecoregions, and climatic regions
dep_gis.maine_topography - contour lines
dep_gis.maine_transportation - roads, train tracks, airports, boat ramps

Imagery data available at the enterprise level include:

- avhrr - low-resolution (1-km) NOAA satellite data for North America from 1992 (prelim)
- dems - 30-meter digital elevation models created from the 1:24,000 USGS contours
- doqs - 1-meter, high-resolution, black-and-white aerial photos for 2/3 of Maine.
- landcover - 3 landcover grids for Maine - Maine Gap Analysis, Multi-resolution landcover characterization (MRLC), and a combination of the two created for LAWB use. Both are based on 30-meter LandSat TM imagery and have classified landcover categories included. Useful at watershed and regional scales.
- landsat_tm - 30-meter color LandSat Thematic Mapper data from 1992. This is the base data from which Gap data were derived. There are 5 bands which can provide with true- or false-color displays.
- noaa - NOAA charts scanned in and registered for MOSIS application.
- spot - 10-meter black-and-white satellite imagery for southern Maine from 2000, originally purchased for E911 project. Useful at town and regional scales.
- tins - terrain models derived from 1:24,000 USGS contour lines.
- usgs100k, 24k, 250k - scanned USGS topo maps at 1:100,000 1:24,000 and 1:250,000, georegistered and seamless. Should be used within appropriate scale ranges. Arranged by quad name.

DEP reports an inventory of approximately 170 individual layers and 22,000 GIS files in its enterprise warehouse. A full itemization of enterprise data resources is available at http://www.state.me.us/dep/gis/ .

Additionally, significant numbers of GIS data layers exist at DEP that are not integrated into the enterprise system. DEP doesn't incorporate data into the enterprise until it is deemed useful to operating business units. Such data are typically utilized and augmented by individual users at the analyst level, and stored in personal workspaces. In some of these data sets quality standards and projection systems vary so as to make them incompatible with enterprise data. There are estimated to be thousands of files in this category in personal workspaces throughout DEP.

Currently unavailable but desired data sets include:

- Shoreland zoning and general zoning data (accurate and current)
- Canadian data (better than existing 1:100,000 scale)
- New Hampshire data (current and projected to Maine standard)
- County/Municipal boundaries without shorelines
- Contour data of higher accuracy (always useful throughout enterprise. 1:24K scale intervals start at 20, not 0 line. This eliminates an accurate shoreline)
- Floodplain map data. DEP claims to be unable to acquire these data from MeGIS
- Wetlands (superior to FEMA quality)
- Land Use data of higher quality
- Would like access to DOT TIDE system
- Soils
- Hydrography of higher quality: indexed, networked and consistent

- Accurate Utility information, primarily for tracking contamination events during transmission.
- Higher quality watersheds

1.1.2.3.2 Attribute and Related Data

All Maine DEP department wide business data are in Oracle. DEP maintains more than 20 large Oracle databases containing these data. The Groundwater database alone contains 72 tables. Additional databases such as HOSS (Hazardous Oil Spill System) and LUST (Leaking Underground Storage Tanks) are thoroughly spatially enabled.

Smaller databases, of which there are estimated to be at least 200, reside in Microsoft Access in individual workspaces.

1.1.2.3.3 Data Issues

- DEP maintains a massively elaborate data infrastructure that is rapidly expanding in scope and complexity. In spite of the admirable work being done to properly position best available technology to manage this thicket, a significant number of databases remain inaccessible through the enterprise model.
- Numerous interviewed DEP staff reported lags or inefficiencies in the data collection and integration system. These centered largely around non-utilized field collected data that reside in small, desktop MS Access applications and aren't made available for enterprise use.
- A huge percentage (estimated 90%) of analyte data that have been collected historically by technical services are not spatially located
- A large number of datalayers are maintained redundantly with MeGIS. Some of these are enhanced for DEP use, but none of the edits and improvements are rolled back into the MeGIS data warehouse.

1.1.2.4 GIS Applications and Application Requirements

Some of the numerous GIS applications DEP is currently administering:

- Maine Oil Spill Information System (MOSIS): Maine Oil Spill Application System (MOSIS) is a software system that allows widely divergent government agencies of disparate jurisdictions and backgrounds to effectively communicate, organize, cooperate, decide and act in the event of an oil spill on the Coast of Maine. MOSIS is intended to be most useful in the first 48 hours of response after a spill occurs.
- Threats Undermining Groundwater (THUGS) Application: Provides ability to do such queries as Show me all wells in the Kennebec river watershed that are within 500 ft. of a stream and within one half mile of a road that have had levels of MTBE greater than 30 ppb reported within the last eighteen months."
- Map atlas creation: standardized and universally accessible DEP atlas generation products:
  - Environmental Vulnerability Index Atlas (80 maps)
  - Maine Resource Mapping Project

    - Public Drinking Water Atlas
- Compound Symbology Mapping: DEP has spent over $100,000 just to develop means in ArcMap environment to generate compound symbols out of multiple databases on a single map
- DEP now maintains a fully independent software testing environment. This permits bolder forays into technical development using all data and software without risk of catastrophic failure.

Planned future GIS activity and applications:
Most of the efforts at data collection, management and value extraction are only beginning to come of age in the DEP enterprise GIS environment. Innumerable GPS data capture initiatives are underway that are immature now but will eventually be enterprise-accessible. These include integrating such layers as gravel pit locations, underground injection conduits and small petroleum spill sites, and developing permit-by-rule data, mobile computing applications, and better 3d modeling capabilities for aerial and sub-surface plumes.

1.1.3 Other Relevant Issues

Data Exchange/Distribution

- Because of the complexity and massive multi-table relational nature of the DEP enterprise data structure, it only behaves effectively as a unified whole. This presents a problem in making the value of this data store available to outside entities. While DEP should not be in competition with MeGIS for dispensing spatial data to the general user community, the products of DEP's work should not be locked up within that department.
- Maine DEP feels that MeGIS should maintain staff exclusively dedicated to user training. This should be undertaken with Maine datasets and Maine examples, thus making it more pertinent and effective than generic training by ESRI staff in Danvers or elsewhere.
- Similarly, there is a sense that MeGIS needs a dedicated metadata manager or point person if there is going to be any effective interagency collaboration in a relationship where data layers are hosted by MeGIS but maintained at other sites. Staff expressed that there is inadequate time to tend to the data itself, much less to properly prepare the metadata that will qualify it for MeGIS warehousing.
- Serving Citrix to satellite offices over the Wide Area Network has suffered difficulties due to inadequaces of network infrastructure and frequent downtime.

Training

- Maine DEP provides significant GIS training both internally and outside the department. Michael Smith's Arc8 training materials are posted publicly and downloaded frequently from locations around the world. A recent re-posting of the availability of these materials on esri-L yielded hundreds of replies.

1.1.4 Major Benefits and Cost Justification

Technical

- The MS Terminal Server and Citrix Metaframe GIS delivery solution spares DEP the cost of desktop processing power necessary for running resource-intensive ArcInfo8 applications.
- Because DEP's enterprise data only behaves effectively as a unified whole, the department has little interest in exporting it in simplified formats (shapefile, coverage, personal geodatabase) for external use by others. But mirroring the entire data model by MeGIS could potentially satisfy the majority of the state's Internet-accessible spatial data distribution needs.

Training

- DEP training materials provide benefits to ESRI software users in and out of the state of Maine. Maine's ESRI user community should be kept actively aware of these and make productive use of them.

General

- Because of its established stature, funding and capability, DEP should be a net technology/training and data exporter to the Maine GIS users.
- DEP has architected and is building a highly sophisticated and scaleable spatial data solution. It will be a great loss if the benefits of this system do not radiate out to serve the larger Maine GIS community.